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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:
YASUHIRO KABU, ET AL.	: EXAMINER: WEISZ, D. G.
SERIAL NO: 10/564,503	:
FILED: JANUARY 13, 2006 RCE FILED: MARCH 2, 2010	: GROUP ART UNIT: 1777
FOR: METHOD FOR SUPPLYING REACTION GASES IN CATALYTIC VAPOR PHASE OXIDATION PROCESS	:

APPEAL BRIEF

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

This is an appeal of the Final Rejection dated September 10, 2010 of Claims 1, 3, 4 and 6-10. A Notice of Appeal was timely filed on December 9, 2010.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Mitsubishi Rayon Co., Ltd. having an address at 6-41, Konan 1-chome, Minato-ku, Tokyo, Japan 108-8506.

II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative and the assignee are aware of no appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 1, 3, 4 and 6-10 stand rejected and are herein appealed. Claims 2 and 5 have been canceled.

IV. STATUS OF THE AMENDMENTS

No amendment under 37 CFR 1.116 has been filed. However, a Request for Reconsideration after Final was filed on November 19, 2010. In an Advisory Action dated December 6, 2010, the Examiner indicated that the rejection would not be withdrawn.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

A summary of the claimed subject matter, as claimed in independent Claims 1 and 6, is mapped out below, with reference to page and line numbers in the specification added in **[bold]** after each element:

Claim 1. A method for supplying reaction gases in a catalytic gas-phase oxidation reaction in which at least a material to be oxidized and a gas containing molecular oxygen are mixed and the resultant mixture is supplied to a catalytic gas-phase oxidation reactor, wherein a feed rate of the material to be oxidized and a feed rate of the gas containing molecular oxygen are adjusted so that when a composition of a gas at the inlet of the catalytic gas-phase oxidation reactor is changed from a reactive composition A point [the concentration of the

material to be oxidized: R(a), and the concentration of oxygen: O(a)] represented by plotting a concentration of the material to be oxidized and a concentration of oxygen in the gas at said inlet to a reactive composition B point [the concentration of the material to be oxidized: R(b), and the concentration of oxygen: O(b)] [with a proviso that the composition A point and the composition B point are compositions outside a range in which the material to be oxidized and oxygen possibly react to cause explosion (an explosion range), and $R(a) \neq R(b)$ and $O(a) \neq O(b)$], compositions on the way of the change from the composition A point to the composition B point fall outside the explosion range, **[page 2, line 22 to page 3, line 11]** wherein the material to be oxidized is isobutylene, tertiary butyl alcohol or methacrolein, **[page 6, lines 2-3]** wherein one of the feed rates of the material to be oxidized and the gas containing molecular oxygen is adjusted in advance by increasing it or decreasing it to the direction away from the explosion range and then the other feed rate is adjusted by increasing it or decreasing it to reach to the composition B point so that the compositions on the way of the change from the composition A point to the composition B point fall outside the explosion range. **[page 6, lines 8-14]**

Claim 6. A computer-readable medium which makes a computer function as a means for showing on a display a compositional range which, in the case at least a material to be oxidized and a gas containing molecular oxygen are mixed, possibly reacts to cause an explosion (an explosion range), **[page 12, lines 11-23]** and as a means for showing on the display a compositional point which is represented by plotting the measured values of concentration of the material to be oxidized and oxygen in a gas at the inlet of a catalytic gas-phase oxidation reactor as well as the explosion range, **[page 12, lines 5-10]** wherein one of the feed rates of the material to be oxidized and the gas containing molecular oxygen is

adjusted in advance from a reactive composition A point by increasing it or decreasing it to the direction away from the explosion range and then the other feed rate is adjusted by increasing it or decreasing it to reach to a reactive composition B point so that the compositions on the way of the change from the composition A point to the composition B point fall outside the explosion range. **[page 6, lines 8-14]**

VI. GROUNDS OF REJECTION

Claims 1, 3-4 and 6-10 stand rejected under 35 U.S.C. § 103(a) as unpatentable over US 2004/0015012 (Hammon et al) in view of WO 2002/068378 by its English language equivalent US 2004/0116746 (Ono et al) and US 6057482 (Okada et al).

VII. ARGUMENT

Claims 1, 3-4 and 6-10 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Hammon et al in view of Ono et al and Okada et al. That rejection is untenable and should not be sustained.

Claim 1 is drawn to a method for supplying reaction gases in a catalytic gas-phase oxidation reaction in which at least a material to be oxidized and a gas containing molecular oxygen are mixed and the resultant mixture is supplied to a catalytic gas-phase oxidation reactor, wherein a feed rate of the material to be oxidized and a feed rate of the gas containing molecular oxygen are adjusted so that when a composition of a gas at the inlet of the catalytic gas-phase oxidation reactor is changed from a reactive composition A point [the concentration of the material to be oxidized: R(a), and the concentration of oxygen: O(a)] represented by plotting a concentration of the material to be oxidized and a concentration of oxygen in the gas at said inlet to a reactive composition B point [the concentration of the

material to be oxidized: R(b), and the concentration of oxygen: O(b)] [with a proviso that the composition A point and the composition B point are compositions outside a range in which the material to be oxidized and oxygen possibly react to cause explosion (an explosion range), and $R(a) \neq R(b)$ and $O(a) \neq O(b)$], compositions on the way of the change from the composition A point to the composition B point fall outside the explosion range, wherein the material to be oxidized is isobutylene, tertiary butyl alcohol or methacrolein, wherein one of the feed rates of the material to be oxidized and the gas containing molecular oxygen is adjusted in advance by increasing it or decreasing it to the direction away from the explosion range and then the other feed rate is adjusted by increasing it or decreasing it to reach to the composition B point so that the compositions on the way of the change from the composition A point to the composition B point fall outside the explosion range.

Claim 6 is drawn to a related embodiment, which is a computer-readable medium.

Thus, the present invention is characterized by increasing or decreasing a feed rate of a gas, and then increasing or decreasing a feed rate of another gas **without shutting off a feed**.

Hammon et al discloses a process in which a feed of gas streams is automatically stopped by a computer system if the distance from the operating point to the nearest explosion limit is below a predetermined minimum value [0058]-[0062], while the present invention instead increases or decreases a feed rate of a gas, and then increases or decreases a feed rate of another gas, in order to make a detour as shown in present Fig. 1 and thereby safely avoid an explosion on increase or decrease of an operating load.

Ono et al is drawn to a method for producing a cyclic aliphatic oxime by oxidizing a cyclic aliphatic primary amine under super atmospheric pressure in the presence of molecular oxygen and a solid catalyst [0002]. The Examiner relies on the disclosure therein that it is

preferred that the oxygen concentration be in a range such that the resultant gaseous phase does not have an explosive composition or that the concentration of oxygen is adjusted to be lower than the lower explosion limit [0087]. The Examiner finds that this disclosure would be interpreted as, in effect, lowering but not terminating the oxygen flow.

Okada et al discloses a process for producing benzyl acetate by oxyacetoxylation using toluene, acetic acid, and oxygen, with an oxyacetoxylation catalyst in an oxyacetoxylation reactor (column 3, lines 59-62), wherein the feed rate of oxygen should be controlled to give the total concentration of toluene, acetic acid and benzyl acetate outside the explosion range at least at the outlet of the oxyacetoxylation reactor (column 4, lines 59-64, column 10, lines 35-41).

The Examiner relies on both Ono et al and Okada et al to find that adjusting the feed rate of oxygen is a well known method of controlling oxygen concentration to avoid an explosion range. The Examiner thus holds that it would have been obvious to adjust the feed rate of oxygen, rather than cutting off the oxygen supply, in the method of Hammon et al to avoid an explosion range while maintaining optimum oxidation-reaction conditions.

In reply, it is not questioned that one of ordinary skill in the art would clearly maintain an oxygen concentration below an explosion limit when carrying out a process susceptible to an explosion when the oxygen concentration exceeds this limit. However, the presently-claimed invention is not simply adjusting a feed rate of oxygen below an explosion limit. Indeed, neither Ono et al nor Okada et al disclose or suggest that one of the feed rates is increased or decreased in a direction away from the explosion range (step 1) and then the other feed rate is increased or decreased to reach the composition B point (step 2), as recited in present Claim 1. Of record are Referential Figs. 7 and 8, which are derived from originally filed Figs. 7 and 8. These figures show the specific steps in Examples 1 and 2 of the

specification herein. While the present claims are not limited to these examples, nevertheless, they provide emphasis to the above argument that the presently-claimed invention is more than simply adjusting an oxygen concentration to below an explosion limit.

The Examiner's response to these arguments is that Hammon et al discloses that "a feed rate of the material to be oxidized and a feed rate of the gas containing molecular oxygen are adjusted" and further, that it would have been obvious that adjusting either of these feed rates would alter the concentration of oxygen.

In reply, the only adjustment contemplated by Hammon et al other than automatic shut-off of the feed of gas streams when the operating point is too close to the explosion limit is initially setting and then keeping the content of at least one organic compound to be partially oxidized in the feed gas mixture below the limiting concentration of the compound [0033]. None of the applied prior art disclose or suggest what Applicants do. While the Examiner simply concludes that it would have been obvious, the underlying disclosures of the applied prior art do not support the holding of obviousness. In other words, the applied prior art neither discloses nor suggests increasing or decreasing a feed rate of a gas, **and** then increasing or decreasing a feed rate of another gas, in order to, in effect, safely avoid a potential explosion.

In the Advisory Action, the Examiner simply repeats the holding of obviousness, without addressing the particular arguments made above.

For all the above reasons, it is respectfully requested that this rejection be REVERSED.

VIII. CONCLUSION

For the above reasons, it is respectfully requested that the rejection be REVERSED.

Respectfully submitted,

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CLAIMS APPENDIX

Claim 1. A method for supplying reaction gases in a catalytic gas-phase oxidation reaction in which at least a material to be oxidized and a gas containing molecular oxygen are mixed and the resultant mixture is supplied to a catalytic gas-phase oxidation reactor, wherein a feed rate of the material to be oxidized and a feed rate of the gas containing molecular oxygen are adjusted so that when a composition of a gas at the inlet of the catalytic gas-phase oxidation reactor is changed from a reactive composition A point [the concentration of the material to be oxidized: R(a), and the concentration of oxygen: O(a)] represented by plotting a concentration of the material to be oxidized and a concentration of oxygen in the gas at said inlet to a reactive composition B point [the concentration of the material to be oxidized: R(b), and the concentration of oxygen: O(b)] [with a proviso that the composition A point and the composition B point are compositions outside a range in which the material to be oxidized and oxygen possibly react to cause explosion (an explosion range), and $R(a) \neq R(b)$ and $O(a) \neq O(b)$], compositions on the way of the change from the composition A point to the composition B point fall outside the explosion range, wherein the material to be oxidized is isobutylene, tertiary butyl alcohol or methacrolein, wherein one of the feed rates of the material to be oxidized and the gas containing molecular oxygen is adjusted in advance by increasing it or decreasing it to the direction away from the explosion range and then the other feed rate is adjusted by increasing it or decreasing it to reach to the composition B point so that the compositions on the way of the change from the composition A point to the composition B point fall outside the explosion range.

Claim 3. The method for supplying reaction gases in the catalytic gas-phase oxidation reaction according to claim 1, wherein in the case there exists the composition C point [the concentration of the material to be oxidized: R(c), and the concentration of oxygen: O(c),

wherein O(c) < O(a), O(c) < O(b) and R(b) > R(c) > R(a) or R(a) > R(c) > R(b)] of the lowest oxygen concentration of an explosion limit in the explosion range, a feed rate of the material to be oxidized and a feed rate of the gas containing molecular oxygen are adjusted so that compositions on the way of the change from the composition A point to the composition B point pass through the composition C' point [the concentration of the material to be oxidized: R(c'), and the concentration of oxygen: O(c'), wherein R(c') = R(c) and O(c') < O(c)].

Claim 4. The method for supplying reaction gases in the catalytic gas-phase oxidation reaction according to claim 1, wherein the range in which the material to be oxidized and oxygen possibly react to cause explosion (the explosion range) and a present compositional point represented by plotting concentrations of the material to be oxidized and oxygen in the gas at the inlet of the catalytic gas-phase oxidation reactor are shown and monitored on a display.

Claim 6. A computer-readable medium which makes a computer function as a means for showing on a display a compositional range which, in the case at least a material to be oxidized and a gas containing molecular oxygen are mixed, possibly reacts to cause an explosion (an explosion range), and as a means for showing on the display a compositional point which is represented by plotting the measured values of concentration of the material to be oxidized and oxygen in a gas at the inlet of a catalytic gas-phase oxidation reactor as well as the explosion range, wherein one of the feed rates of the material to be oxidized and the gas containing molecular oxygen is adjusted in advance from a reactive composition A point by increasing it or decreasing it to the direction away from the explosion range and then the other feed rate is adjusted by increasing it or decreasing it to reach to a reactive composition

B point so that the compositions on the way of the change from the composition A point to the composition B point fall outside the explosion range.

Claim 7. The method of supplying reaction gases in the catalytic gas-phase oxidation reaction according to claim 1, wherein the material to be oxidized is isobutylene.

Claim 8. The method of supplying reaction gases in the catalytic gas-phase oxidation reaction according to claim 1, wherein the material to be oxidized is tertiary butyl alcohol.

Claim 9. The method of supplying reaction gases in the catalytic gas-phase oxidation reaction according to claim 1, wherein the material to be oxidized is methacrolein.

Claim 10. The method of supplying reaction gases in the catalytic gas-phase oxidation reaction according to claim 1, wherein the change from the composition A point to the composition B point is carried out through multiple composition points.

EVIDENCE APPENDIX

Referential Figs. 7 and 8, filed June 30, 2010.

FIG. 7

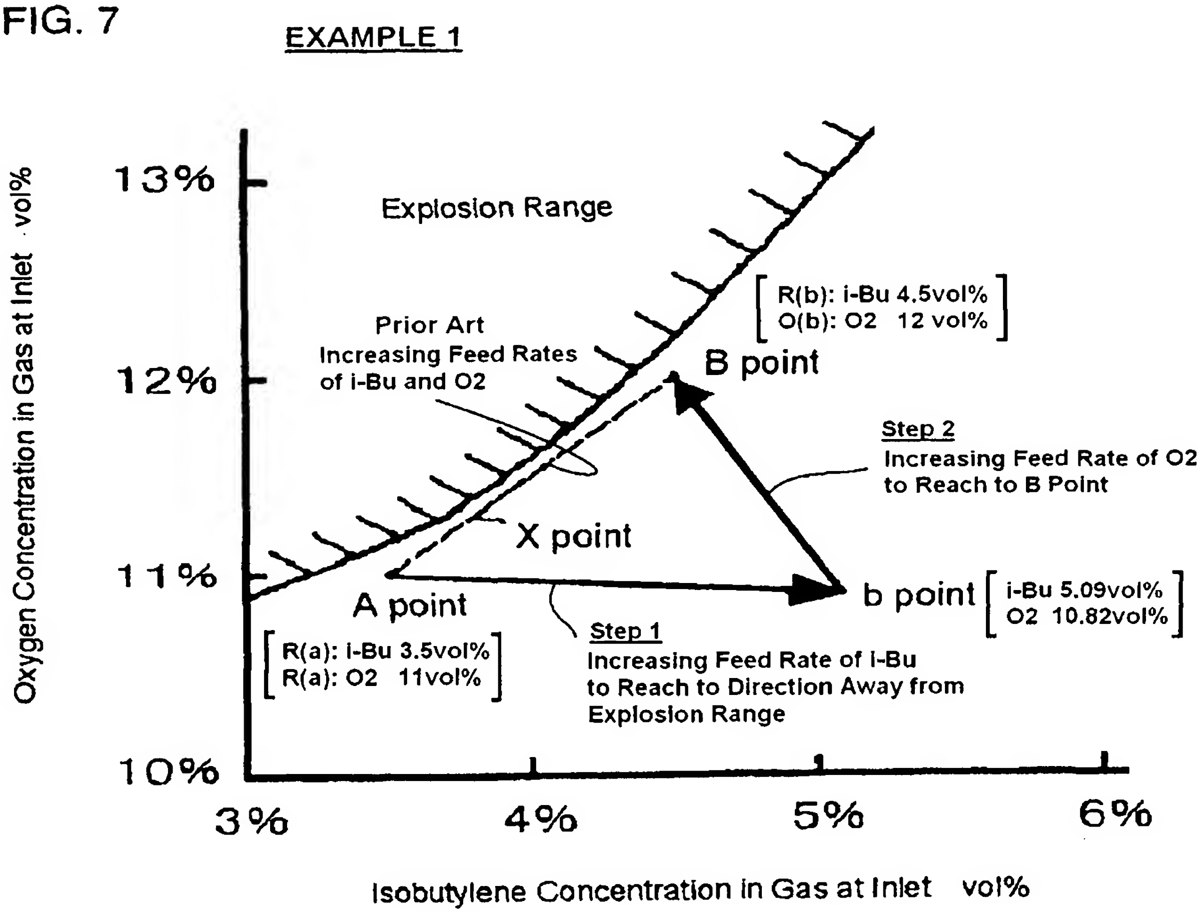
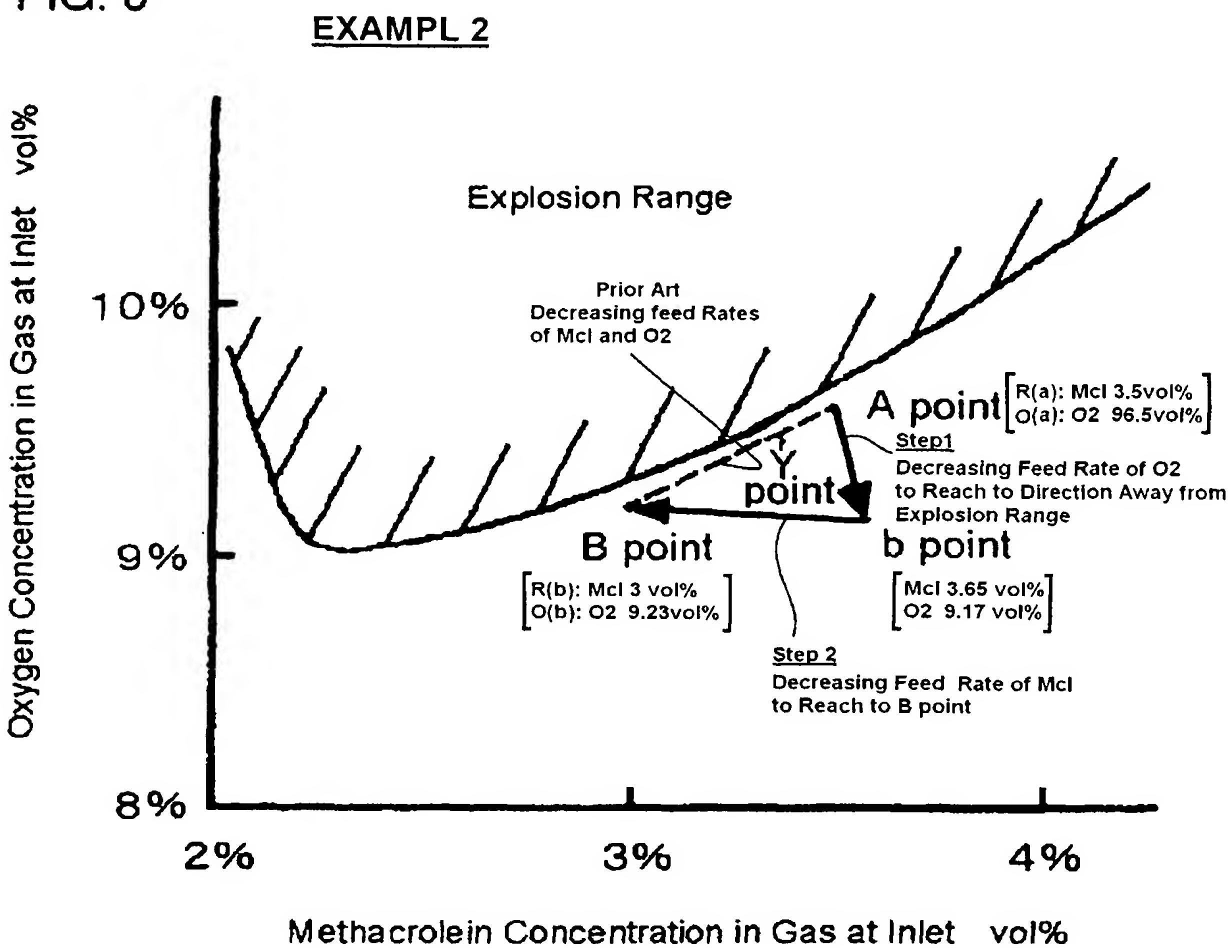

EXAMPLE 1
Explosion Range
Prior Art
Increasing Feed Rates
of i-Bu and O2
R(b): i-Bu 4.5vol%
O(b): O2 12 vol%
B point
Step 2
Increasing Feed Rate of O2
to Reach to B Point
X point
A point
b point
i-Bu 5.09vol%
O2 10.82vol%
R(a): i-Bu 3.5vol%
R(a): O2 11vol%
Step 1
Increasing Feed Rate of i-Bu
to Reach to Direction Away from
Explosion Range
13%
12%
11%
10%
3%
4%
5%
6%
Oxygen Concentration in Gas at Inlet vol%
Isobutylene Concentration in Gas at Inlet vol%

FIG. 8


EXAMPL 2
Oxygen Concentration in Gas at Inlet vol%
Explosion Range
10%
9%
8%
2%
3%
4%
Prior Art
Decreasing feed Rates
of Mcl and O2
A point
R(a): Mcl 3.5vol%
O(a): O2 96.5vol%
Step1
Decreasing Feed Rate of O2
to Reach to Direction Away from
Explosion Range
Y
point
B point
R(b): Mcl 3 vol%
O(b): O2 9.23vol%
b point
Mcl 3.65 vol%
O2 9.17 vol%
Step 2
Decreasing Feed Rate of Mcl
to Reach to B point
Methacrolein Concentration in Gas at Inlet vol%

RELATED PROCEEDINGS APPENDIX

None.